PROCEEDINGS OF SCIENTIFIC SOCIETIES.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. — NATURAL HISTORY SECTION. *Burlington, Vt., August* 21–26, 1867. "On the Zoölogical Affinities of the Tabulate Corals." By Professor A. E. Verrill. Coral-like forms were stated to be formed by various kinds of animals, and also by some plants. Thus we have Protozoön corals (*Eozoön, Polytrema*, stony sponges, etc.); Molluscan corals (*Bryozoa*); Hydroid corals (*Sertularia, etc.*); Polyp corals (*Gorgonia, Tubipora, Madrepora, etc.*); Vegetable corals (*Nullipora, Corallina*).

Although there are still some doubtful groups of corals, the nature of most forms is now well known. The most important doubtful groups are at present the Cyathophylloid corals (*Rugosa* Edw.), and the Tabulate corals. Nearly all authors place both these great groups among the true Polyps, but a few advocate the Molluscan affinities of some of the Cyathophylloids, and certain genera of the Tabulata (*Chætetes, etc.*), the former being compared with Hippurites, etc., and the latter with Bryozoa.

Professor Agassiz has, however, referred both these groups to the Hydroids, placing them, therefore, in the class of Acalephs. As both are abundant in the Silurian rocks, this generalization carries the appearance of the Acalephs back from the Jurassic to the Lower Silurian period. Therefore this becomes a question of importance both in Geology and Zoölogy. The Cyathophylloid corals being entirely extinct, their real affinities may, perhaps, long remain in doubt. The Tabulata, however, are still represented in tropical seas by several genera and numerous species.

Professor Agassiz examined the living animals of Millepora several years ago at Florida, and in his "Contributions" has figured and described them, showing them to be genuine Hydroids, the different-sized cells being occupied by different sorts of individuals, comparable to the different kinds of individuals in the communities of various other Hydroids. From these observations, upon a single genus, he has concluded that all other Tabulate corals, living and fossil, are also Hydroids. In the hope of throwing some light upon this question, Mr. F. H. Bradley was requested, while collecting at Panama for the Yale College Museum, to examine, if possible, the living animals of a species of *Pocillipora* found at that place, a coral belonging to the Tabulata, but to a family (*Favositidæ* Edw.) differing in many characters from Milleporidæ. According to his descriptions and drawings, the animals of Pocillipora have all the external appearances and structure of a true Polyp, closely resembling those of Porites. They are

exsert when expanded, and have twelve equal cylindrical tentacles surrounding the margin in a single circle, six of them being held horizontally, and the alternating ones erect. This peculiar posture was the principal difference observed between these animals and those of *Porites*, when compared side by side.

From the disagreement in the character of the animals of *Millepora* and *Pocillipora*, in connection with great differences in the corals, it is necessary to refer the former to the Hydroids, while the latter must remain with the true Polyps. It is probable that *Favosites*, and many other extinct tabulated genera belong with *Pocillipora*, while *Heliolites*, etc., may go with *Millepora*. Therefore we must regard the Tabulate structure as a character of secondary importance and the artificial group of *Tabulata* must be dismembered.

"On the Coal Measures of Illinois, with a vertical section of the Strata." By A. H. Worthen, State Geologist. In the prosecution of the Geological Survey of Illinois, it seemed desirable to identify our coal-seams with those of the Kentucky section, inasmuch as the Illinois and Kentucky coal-field was known to belong to the same basin; and with this end in view, a general examination of our coal-measures was made by Professor Lesquereux, and the results were published in the first volume of the Illinois Report. Subsequent investigations showed that the conclusions arrived at in regard to the position that the main coal-seams occupied in the Illinois section, especially those recognized as the equivalents of Nos. 5-9 and 11, of the Kentucky section, were erroneous, and that if that section was correct, no parallelism could be made out between the coal-seams of the two States.

In order to determine correctly the sequence of the coal strata, as they are developed in Central and Northern Illinois, a section was constructed the present season along the valley of the Illinois River, which traverses the coal-field from south-west to north-east, for a distance of about one hundred miles. This section shows the development of six beds of workable coal, together with four or five thin coals, varying from a few inches to two feet in thickness, and the whole are enclosed in about five hundred feet of measures immediately above the conglomerate. This includes all the workable coals at present known in the State. By comparing the Illinois with the Kentucky section, we found a general correspondence in the lower part of each, but nothing in the Illinois section to correspond with the *Anvil Rock Sandstone* and the beds intervening between that and the *Mahoning Sandstone*. Taking these beds from the Kentucky section we have a general agreement between the two. Hence we were led to conclude that in constructing the section in Kentucky, a single

sandstone, outcropping at different localities, had been mistaken for two different beds, to one of which the name of Anvil Rock was given at one locality, while at the other it was called Mahoning Sandstone, and in this way their section was increased in thickness about three hundred feet or more beyond what it really should be, and the number of workable coal-seams nearly doubled.

This view of the case is strengthened by the fact also of a general correspondence between the upper portions of the two sections, both of which are characterized by several thin seams of coal, of little or no value in consequence of the thinness of the strata, while the limestones in this part of the Illinois section are characterized by a group of fossils recognized by Professor Meek as common in the upper coal-measures of Kanzas, and as the equivalent of beds to which the term "*Permo-carboniferous*" was applied by himself and Dr. Hayden in their paper on the rocks of Eastern Kansas.

Again, by placing these sandstones on a parallel, and giving a downward section for three hundred feet as given in the Kentucky section, and we have an almost equal repetition of beds.

If we take the Kentucky section as published, and place these sandstones on a parallel, we find an almost exact repetition of the strata for 300 feet below, and from these facts we are forced to conclude that the Anvil Rock and Mahoning Sandstones are identical, and that the section should be shortened by extracting from it all the strata composing the first-named Sandstone, and the beds supposed to intervene between it and the lower bed. This gives a general correspondence between the Illinois and Kentucky sections, such as might be expected to occur in different portions of the same coal-field.

"On the Lower Silurian Brown Hematite Beds of America." By B. S. Lyman. Some thirty exposures of brown hematite, in Smyth county, South-western Virginia, are found by a rough topographical survey to belong apparently to the outcrops of four ore-beds, conformable to the Lower Silurian rocks of the region. At three or four exposures the solid ore-bed is to be seen; at the others only loose lumps of ore mixed with loam.

The other American brown hematite deposits of the same age, resemble these so closely as to leave the impression that where only loose lumps of ore occur, mixed with loam or other materials, they are always mere rubbish that has been accumulating near the outcrop of regular beds ever since the denudation began; similar to the loose blocks of sandstone near the outcrop of a sandstone bed, or to the coal-dirt of a coal outcrop, or to gold or tin alluvial deposits, making allowance of course in the comparison for the characteristic

hardness and heaviness of the brown hematite, and for the thickness of its beds. The ore lumps would be mixed not only with the rubbish of neighboring rock-beds, but with the remains of plants that grew during the accumulation of the ore-lumps, such as the Brandon and Mont Alto lignites. Lumps of carbonate of iron, found in some such deposits, go towards showing that the ore was originally a carbonate, and afterwards altered as the coal-measure carbonates so often are. The author thought these lumps were not concretions.

"The Winooski Marble of Colchester, Vermont." By C. H. Hitchcock. Rough and polished specimens of a beautiful marble, obtained from localities less than six miles from Burlington, were exhibited. It belongs to the lower part of the Potsdam group, and is a silicious dolomite. It contains nodules of calcite enclosing amorphous silica, which render the stone more difficult to saw than statuary marble. The prevailing color is some shade of red, with variations of white, brown, chocolate, and yellowish tints.

"The Distortion and Metamorphosis of Pebbles in Conglomerate." By C. H. Hitchcock. In this paper the doctrine was advanced that the pebbles of certain conglomerates had been very much distorted since their deposition as a coarse sediment, and that in some the chemical character had been altered by metamorphism, so that fragments, originally an impure limestone or a schist, had become changed into quartz. The process had probably been carried so far in some instances specified, that the original sandstone and conglomerates had been converted into schists, gneiss, and granite. The agents producing these changes were thought to be the chemical action of infiltrating mineral waters intensified by the immense pressure, accompanied by a slight plasticity of the pebbles, perhaps no more than is implied by a thorough warm aqueous interpenetration of the masses. Every case described was in a highly disturbed region, where numerous plications in the strata had been observed. Where it was possible to trace a band of rock from a crumpled to its normal position, it was noticed that in the undisturbed state the mass was simply a loosely cemented coarse gravel, with round pebbles; but where folds abounded, the stones had been indented, flattened, and bent, and the cement had become crystalline. Localities were noticed from Middleton, R. I., Bellingham, Mass., Washington County, Mount Battie, and Sandy River Plantation, Me., East Wallingford, and Plymouth, Vt., the Nagelflue in Switzerland, and the Permian conglomerate in England, etc. The opinions of eminent European geologists in favor of a superinduced distortion were quoted, as well as the experiments of Mr. Sorby, illustrating the greater efficiency of chemical action under pressure.

"The Geology of Vermont." By C. H. Hitchcock. A large geological map of this State was shown, illustrating the great advance of our knowledge of its rocky structure since the publication of the author's map in the Final Report upon the Geology of Vermont in 1861. The additions to our knowledge were largely afforded by the extension southerly of the recent discoveries of the Canadian survey.

"Explanation of a Geological Map of Maine." By C. H. Hitchcock. The author exhibited a large geological map of Maine, prepared from the materials gathered during two years work in the service of the State in 1861, 1862.

BOSTON SOCIETY OF NATURAL HISTORY. *October* 2, 1867.—The President exhibited a series of Flint instruments from the Island of Regan, and from Norway and Sweden, consisting of arrow and spear heads, square cut chisels, etc. One was a hatchet with a circular hole for the insertion of the handle, the interior of which was smooth and the diameter uniform. Mr. Rau, the Danish Consul at New York, had shown how these holes might be drilled, by boring half through a paving stone with a rotating broomstick and sand. A few implements representing saws and knives, and one, undoubtedly used as a dagger, but resembling a large spear-point, were among the articles exhibited; most of them were unlike anything found in this country.

Dr. Wyman further gave an account of a recent visit of a party of members of the society to shell-heaps upon Goose Island, in Casco Bay. The objects exhumed were mostly similar to those found at Mount Desert, and described by Dr. Wyman at a previous meeting. Among the most interesting were bones, apparently of the Great Auk, a bird now extinct on our coast.

Mr. Edward S. Morse called attention to the evidences of great antiquity in the shell-heaps upon Goose Island. The deposits consisted of large beds of broken clam-shells, with other species intermixed. Over five hundred square feet of surface had been examined, and the absence of any metal and singular scarcity of stone implements were noteworthy. The heaps, which thickened towards the centre, covered areas of from ten to fifteen feet in diameter, and showed an outcrop on the bank of from two or three to fourteen or fifteen inches in height. Since in many cases heaps of this magnitude had been almost wholly washed away, an extensive erosion of the bank must have taken place since the formation of the deposits. Coupled with this fact, Mr. Morse observed one place where the erosion of the bank had exposed the surface of a rock smoothed and scratched by glaciers, and sufficient time had elapsed to erase nearly all these marks from the hard rock. He also remarked that the shell-heaps appeared to rest on

the primitive soil; the turf covered the heaps to the depth of six or seven inches, while there were no traces of soil below. The land-shells, such as *Helix Sayii, indentata, multidentata*, and others, remains of which were found in the lower portions of the heaps, can only exist in hard-wood growths. The portion of the island where these heaps occur is at present covered with large spruce growth. The Quahog, found plentifully in these heaps, is extremely rare in Maine. Thus we have a change of vegetation, a change of certain species of animals, an evidence of extensive erosion of the banks, an absence of articles that we would be likely to find in deposits of recent formation, all indicating extreme age. Hundreds and perhaps thousands of years may have elapsed since these heaps were commenced. The Danish archæologists regarded similar heaps in Denmark as being older than the stone age — in fact, as among the earliest evidences of the presence of man.

A short discussion ensued upon the probability that the shell-heaps rested upon the primitive soil. Mr. Scudder wished to know what had become of the vegetable mould which must have supported the hard-wood growth, beneath which the land-shells, found at the bottom of the shell-heaps, lived. Dr. Pickering believed that vegetable mould would disappear after the lapse of ages by the action of the elements, and Dr. Jackson spoke of the chemical means by which this could be brought about.

Papers were read by Dr. H. Hagen, Mr. P. R. Uhler, and Mr. S. H. Scudder, on the Dragon-flies of the West Indies.

Lyceum of Natural History. *New York, April* 29, 1867. — Mr. C. F. Hartt gave an account of the glacial phenomena about Rio Janeiro, observed by him while a member of the late Thayer Expedition, from Cambridge, under Professor Agassiz. He dwelt at much length on the glacial phenomena exhibited about Rio, which he traced as far north as Bahia, but which Professor Agassiz has claimed to have seen on the Amazon. "Everywhere," said the speaker, "the gneiss hills are rounded evenly down so as to present all the appearance of '*roches moutonnées*,' and immediately over their surface, and clinging closely to it, is a sheet of quartz pebbles, sometimes large, rounded boulders, more or less thick (occasionally absent), following all the curves of the surface, and sometimes found on slopes where the material could never have been deposited by water, and where it is only held in place by a superincumbent sheet of red sandy clay, very variable in thickness, such as would result from the mechanical grinding up of the gneiss. This clay shows no evidence of the sorting action of water, the felspathic clay, broken quartz grains and mica crystals

being all present. It contains occasional angular and rounded fragments of quartz, sometimes of gneiss or some other material, scattered through it."

This drift-sheet was described as extending from the Sierras down over the tertiary deposits occupying the low grounds along the shore. The speaker mentioned the existence of cretaceous beds near Bahia, some fish remains which he found having been identified as cretaceous by Professor Agassiz, and he spoke of the evidence of recent changes of level along the Brazilian coast. He had examined the stone reefs at Pernambuco, Bahia, St. Cruz, and Porto Seguro, and described them as sea beaches which had been solidified by the lime of sea-shells, and which, having been separated from the shore by the encroachment of the sea, now extend along it like linear walls of rock. At Porto Seguro he discovered quite an extensive reef of coral, which he was able to trace southward to the Abrolhos Islands. This reef he saw at a very low tide exposed off Porto Seguro over an area several miles long. The corals grow up sometimes in isolated clumps like mushrooms, and the natives call them *chaparoens*. He spoke of the interest attaching to a still further exploration of this reef, for it is an entirely new ground, and would certainly afford some new and interesting facts to science. He announced that it was his intention to spend his summer vacation on the Abrolhos, taking with him a party, which he hoped would be fitted out by the new Natural History Section of the Cooper Institute.

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